PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

Assistant Commissioner for Patents
United States Patent and Trademark Office
Box PCT
Washington, D.C.20231
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 12 October 2000 (12.10.00)	
International application No. PCT/IB00/00145	**Applicant's or agent's file reference** CCM005BWO
International filing date (day/month/year) 10 February 2000 (10.02.00)	**Priority date** (day/month/year) 10 February 1999 (10.02.99)
Applicant BEDETTI, Gianfranco	

1. The designated Office is hereby notified of its election made:

[X] in the demand filed with the International Preliminary Examining Authority on:

08 September 2000 (08.09.00)

[ ] in a notice effecting later election filed with the International Bureau on:

2. The election [X] was

[ ] was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO **, 34, chemin des Colombettes** **1211 Geneva 20, Switzerland**	Authorized officer Pascal Piriou
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
CCM005BWO		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/IB00/00145	10/02/2000	10/02/1999
International Patent Classification (IPC) or national classification and IPC C01B3/38		
Applicant CASALE CHEMICALS S.A. et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 3 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations suporting such statement
   - VI ☐ Certain documents cited
   - VII ☒ Certain defects in the international application
   - VIII ☒ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
08/09/2000	16.05.2001
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Van Iddekinge, R Telephone No. +49 89 2399 8346

Form PCT/IPEA/409 (cover sheet) (January 1994)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/IB00/00145

I. Basis of the r port

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:
Description, pages:

1-27	as originally filed				

Claims, No.:

2-4,6-17	as originally filed				
1,5	as received on	27/04/2001	with letter of	28/04/2001	

Drawings, sheets:

1-3	as originally filed				

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

   These elements were available or furnished to this Authority in the following language: , which is:

   - ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
   - ☐ the language of publication of the international application (under Rule 48.3(b)).
   - ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   - ☐ contained in the international application in written form.
   - ☐ filed together with the international application in computer readable form.
   - ☐ furnished subsequently to this Authority in written form.
   - ☐ furnished subsequently to this Authority in computer readable form.
   - ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
   - ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

   (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-17
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-17
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-17
	No:	Claims	

2. Citations and explanations
   see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

R It m V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1). Reference is made to the following documents:
D1=Hydrocarbon Processing, vol. 72 (1993), no. 1, pages 77-85
D2=Nitrogen, march/April 1995, no. 214, pages 38-56
D3=US-A-3945942
D4=Ammonia Plant Safety & Related Facilities, vol. 34, 1994, pages 205-215

Novelty

2). The subject-matter of the present claims is novel because none of the available prior art documents disclose the particular burner arrangement according to the characterizing parts of claims 1 and 5.

Claim 1

The process for secondary reforming according to claim 1 is novel because D1, D2 or D4 do not disclose that the gas flow comprising oxygen is fed into the combustion chamber in the form of a plurality of jets which are generated by corresponding parallel streamtubes having equal gas velocity and that the oxygen comprising gas jets are not laid the one upon the other with respect to the direction of the gas flow comprising hydrocarbons, see D1: figures 5, 6 and the corresponding description on pages 80, 82 and D2: figure 3 and the corresponding description; page 48: "Burners" and D3: figures 1-3; table I and D4: pages 210-211, "Industrial Experience".

In the last part of claim 1 it is mentioned that the local ratio of the gasses is constant. When good mixing of the gas flows is ensured the local ratio of the gasses will be constant. D1, D2 and D4 all disclose that good mixing is important.

Claim 5

The burner suitable for secondary reforming according to claim 5 of the application is novel, because none of the relevant prior art documents D1, D2, D3

or D4 disclose the characterizing part of claim 1, see D1: figure 6 and the corresponding description on page 82 and D2: figure 3 and the corresponding description; page 48: "Burners" and D3: figures 1-3; table I and D4: pages 210-211, "Industrial Experience".
Since the apparatus according to claim 17 comprises the burner according to claim 5, said the subject-matter of said claim is also novel.

Therefore claims 1, 5 and 17 and their dependent claims 2-4, 6-16 fulfil the requirements of Article 33(2) PCT (novelty).

3). The object of the present application is providing a process for secondary reforming with a high yield which is easy to carry out and does not require high operating and maintenance costs.
It is credible that the particular burner used in the present invention allows an improved burner efficiency.

Therefore claims 1, 5 and 17 and their dependent claims 2-4, 6-16 fulfil the requirements of Article 33(3) PCT (inventive step).

Re Item VII
Certain defects in the international application

4). Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the documents D1, D2 and D4 are is not mentioned in the description, nor are these documents identified therein.

Re Item VIII
Certain observations on the international application

5). The terms "along a predetermined direction" and "the jets being not laid the one upon the other with respect to said direction of the flow comprising hydrocarbons" used in claim 1 is vague and unclear and leaves the reader in doubt as to the meaning of the technical features to which it refers, thereby rendering the definition of the subject-matter of said claim unclear (Article 6 PCT).

6). The term "arranged so as not to lay the one upon the other with respect to a direction orthogonal to said lower end of said at least one collector" used in claim 5 is vague and unclear and leaves the reader in doubt as to the meaning of the technical features to which it refers, thereby rendering the definition of the subject-matter of said claim unclear (Article 6 PCT).

CLAIMS

1. Process for secondary reforming comprising the steps of:

- feeding a gas flow comprising oxygen in a combustion chamber through a feeding duct of a burner;

- feeding a gas flow comprising hydrocarbons in said combustion chamber through a substantially annular passage defined externally to said feeding duct along a predetermined direction;

- mixing and reacting said gas flow comprising oxygen with said gas flow comprising hydrocarbons inside said combustion chamber, obtaining a gas flow comprising hydrogen and carbon monoxide;

- feeding said gas flow comprising hydrogen and carbon monoxide to a catalytic bed which lays below said combustion chamber for carrying out a steam reforming reaction;

characterized in that it comprises the steps of:

- feeding said gas flow comprising oxygen in said combustion chamber in the form of a plurality of jets generated by corresponding parallel streamtubes having equal velocity, the jets being not laid the one upon the other with respect to said direction of the flow comprising hydrocarbons;

- splitting said plurality of jets within the gas flow comprising hydrocarbons in said combustion chamber;

- mixing in said combustion chamber the gas flow comprising

oxygen with amounts of gas flow comprising hydrocarbons at local constant ratio.

AMENDED SHEET

5. Burner for secondary reforming of the type comprising:

- a substantially cylindrical duct (12) of predetermined length for feeding a gas flow comprising oxygen to a combustion chamber (4) beneath the burner;

characterized in that it further comprises:

- at least one collector (15) for said gas flow comprising oxygen protruding from an end (12a) of said duct (12) of the burner and in fluid communication therewith, comprising a plurality of nozzles (16) distributed along a perimeter of said at least one collector (15) near a lower end (15a) thereof and arranged so as not to lay the one upon the other with respect to a direction orthogonal to said lower end (15a) of said at least one collector (15).

PATENT COOPERATION TREATY

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INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	**FOR FURTHER ACTION** see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
CCM005BWO		
International application No.	International filing date *(day/month/year)*	(Earliest) Priority Date *(day/month/year)*
PCT/IB 00/00145	10/02/2000	10/02/1999
Applicant		
CASALE CHEMICALS S.A. et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

[X] It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

   a. With regard to the **language,** the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

   [ ] the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

   b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

   [ ] contained in the international application in written form.

   [ ] filed together with the international application in computer readable form.

   [ ] furnished subsequently to this Authority in written form.

   [ ] furnished subsequently to this Authority in computer readble form.

   [ ] the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

   [ ] the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. [ ] **Certain claims were found unsearchable** (See Box I).

3. [ ] **Unity of invention is lacking** (see Box II).

4. With regard to the **title,**

   [X] the text is approved as submitted by the applicant.

   [ ] the text has been established by this Authority to read as follows:

5. With regard to the **abstract,**

   [X] the text is approved as submitted by the applicant.

   [ ] the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No. 3

   [X] as suggested by the applicant.

   [ ] because the applicant failed to suggest a figure.

   [ ] because this figure better characterizes the invention.

   [ ] None of the figures.

INTERNATIONAL SEARCH REPORT

Intern ...ial Application No
PCT/IB 00/00145

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 C01B3/38 C01B3/36 B01J8/02 F23D14/32 F23D14/58
F23D14/56

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 C01B B01J F23D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
WPI Data, PAJ, INSPEC, COMPENDEX, API Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	BAADE W F ET AL: "GENERATE HYDROGEN FOR REFORMULATED GASOLINE AND CLEAN DIESEL REQUIREMENTS. \OXYGEN SECONDARY REFORMING ADDS H2 CAPACITY WITHOUT INCREASED NOX AND SOX EMISSIONS" HYDROCARBON PROCESSING,US,GULF PUBLISHING CO. HOUSTON, vol. 72, no. 1, 1 January 1993 (1993-01-01), pages 77-80,82,84-, XP000332536 ISSN: 0018-8190 page 81 -page 82 figure 6 ---	1,5,17
X	US 3 945 942 A (REYNOLDS BLAKE ET AL) 23 March 1976 (1976-03-23) column 3, line 20 -column 4, line 6 figures 2-5; table 1 --- -/--	5

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
11 July 2000	18/07/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Van der Poel, W

Form PCT/ISA/210 (second sheet) (July 1992)

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
X	"REFINING REFORMING TECHNOLOGY" NITROGEN,GB,BRITISH SULPHUR CO, LONDON, no. 214, 1 March 1995 (1995-03-01), pages 38,40-46,48-, XP000502771 ISSN: 0029-0777 page 41: secondary reforming page 48: burners	1,5,17
A	THOMAS S. CHRISTENSEN ET AL.: "Design and performance of secondary and autothermal reforming burners" AMMONIA PLANT SAFETY & RELATED FACILITIES, vol. 34, 1994, pages 205-215, XP000913993 New York the whole document	1,5,17
P,A	EP 0 959 120 A (KATO HAJIME) 24 November 1999 (1999-11-24) figure 10 column 15, line 44 -column 16, line 8	1,5,17
A	& WO 98 14536 A 9 April 1998 (1998-04-09)	1,5,17

INTERNATIONAL SEARCH REPORT

Information on patent family members

Intern ial Application No
PCT/IB 00/00145

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3945942 A	23-03-1976	AT 348974 B	12-03-1979
		AT 111172 A	15-08-1978
		BE 778544 A	26-07-1972
		CA 947973 A	28-05-1974
		DE 2204601 A	12-04-1973
		DK 136056 B	08-08-1977
		FR 2155185 A	18-05-1973
		GB 1335521 A	31-10-1973
		IT 947117 B	21-05-1973
		JP 57017036 B	08-04-1982
		JP 48044825 A	27-06-1973
		LU 64685 A	23-08-1972
		NL 7200927 A,B	06-04-1973
		SE 384843 B	24-05-1976
		US 3758037 A	11-09-1973
		ZA 7200335 A	30-05-1973
EP 0959120 A	24-11-1999	AU 4470697 A	24-04-1998
		WO 9814536 A	09-04-1998